

REMARKS

This application has been reviewed in light of the Office Action mailed on March 1, 2004. Claims 1-16 are pending in the application with Claims 1 and 9 being in independent form. By the present amendment, Claims 1 and 9 have been amended. No new matter or issues are believed to be introduced by the amendments.

In the Office Action, Claims 1, 7 and 9 were rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 5,370,118 issued to Vij et al. on December 6, 1994 (“Vij et al.”).

Independent Claims 1 and 9 have been amended in a manner which is believed to better define Applicants’ invention and to overcome the rejection. Claim 1 has been amended to recite “A magnetic resonance imaging apparatus comprising: an RF coil system comprising at least two sets of at least two RF coils which detects RF signals from a region of interest, at least two receiver channels which receive and process the detected RF signals, and a control unit which controls at least one switch that selectively routes at least one detected RF signal towards separate receiver channels via one particular path of at least two possible paths, said at least one detected RF signal is combined with an RF signal of at least two RF coils depending on the imaging parameters, said control unit applies the combined RF signals to separate receiver channels, such that at least two detected RF signals can be combined to form a combined signal and the combined signal is applied to one particular receiver channel.” (Emphasis added) Claim 9 has been amended to recite similar recitations as the recitations added to Claim 1.

Vij et al. does not disclose or suggest at least the newly added limitations to Claims 1 and 9. Vij et al. is directed to a quadrature local coil which includes two coil sets

placed on opposite sides of the patient, each coil set having a single loop and a split loop so as to be sensitive to quadrature components of a flux field centered between the coil sets. Figure 5 is a schematic diagram of the coils of the coil sets showing combining of the signals from each coil using combining networks 82 and 86. Vij et al. does not disclose or suggest structure for selectively routing each signal via one particular path of at least two possible paths prior to being combined with another signal by either combining network 82 or 86. Each signal is routed along a fixed route, as shown by Figure 5, and combined by either combining network 82 or 86. Figure 5 does not include at least one switch or any type of switching assembly for selectively routing each signal between via one particular path of at least two possible paths, as recited by Applicants' Claims 1 and 9, let alone, towards separate receiver channels.

More specifically, Vij et al. does not disclose or suggest at least one switch that selectively routes at least one detected RF signal towards separate receiver channels via one particular path of at least two possible paths, as recited by Applicants' Claim 1. Further, Vij et al. does not disclose or suggest the step of controlling at least one switch that selectively routes at least one detected RF signal towards separate receiver channels via one particular path of at least two possible paths, as recited by Applicants' Claim 9. Accordingly, withdrawal of the rejection under 35 U.S.C. §102(b) and allowance of Claims 1 and 9 are respectfully requested.

Claim 7 depends from Claim 1 and Claim 15 depends from Claim 9, and therefore include the limitations of Claims 1 and 9, respectively. Accordingly, for the same reasons given for Claims 1 and 9, Claims 7 and 15 are believed to contain patentable subject

matter. Accordingly, withdrawal of the rejection under 35 U.S.C. §102(b) and allowance of Claims 7 and 15 are respectfully requested.

Claims 1-7 and 9 were rejected under 35 U.S.C. §102(e) as being anticipated by U.S. Patent No. 6,377,044 issued to Burl et al. on April 23, 2002 (“Burl et al.”).

Independent Claims 1 and 9 have been amended in a manner which is believed to better define Applicants’ invention and to overcome the rejection. Claim 1 has been amended to recite “A magnetic resonance imaging apparatus comprising: an RF coil system comprising at least two sets of at least two RF coils which detects RF signals from a region of interest, at least two receiver channels which receive and process the detected RF signals, and a control unit which controls at least one switch that selectively routes at least one detected RF signal towards separate receiver channels via one particular path of at least two possible paths, said at least one detected RF signal is combined with an RF signal of at least two RF coils depending on the imaging parameters, said control unit applies the combined RF signals to separate receiver channels, such that at least two detected RF signals can be combined to form a combined signal and the combined signal is applied to one particular receiver channel.” (Emphasis added) Claim 9 has been amended to recite similar recitations as the recitations added to Claim 1.

Burl et al. does not disclose or suggest at least the newly added limitations to Claims 1 and 9. Burl et al. is directed to a magnetic resonance apparatus which includes a multi-mode receiver assembly which facilitates operation in both a quadrature combination mode and phased array mode. In the quadrature combination mode, two RF signals are combined to produce two signals; each of the two signals produced is applied to a separate receiver channel, i.e., either channel 1 or 2. Burl et al. also discloses that in

a neck imaging application, at least one butterfly and one loop or ladder coil are combined in quadrature as a single channel. See col. 5, lines 37-39. Hence, Burl et al. suggests the use of a combiner, such as combiner 42, for performing this function. In the phased array mode, two RF signals are not combined, but delayed with respect to each other and passed separately to the receiver channels. See col. 4, lines 43-59.

As discussed above with respect to Vij et al., Burl et al. also does not disclose or suggest at least one switch that selectively routes at least one detected RF signal towards separate receiver channels via one particular path of at least two possible paths, as recited by Applicants' Claim 1, when operating in the quadrature combination and phased array modes. Further, Burl et al. does not disclose or suggest the step of controlling at least one switch that selectively routes at least one detected RF signal towards separate receiver channels via one particular path of at least two possible paths, as recited by Applicants' Claim 9, when operating in the quadrature combination and phased array modes. Accordingly, withdrawal of the rejection under 35 U.S.C. §102(e) and allowance of Claims 1 and 9 are respectfully requested.

Claims 2-7 depend from Claim 1, and therefore include the limitations of Claim 1. Accordingly, for the same reasons given for Claim 1, Claims 2-7 are believed to contain patentable subject matter. Accordingly, withdrawal of the rejection under 35 U.S.C. §102(e) and allowance of Claims 2-7 are respectfully requested.

Claims 1, 2, 4-6, 9, 10 and 12-14 were rejected under §102(e) as being anticipated by U.S. Patent No. 6,356,081 B1 issued to Misic on March 12, 2002 ("Misic").

Independent Claims 1 and 9 have been amended in a manner which is believed to better define Applicants' invention and to overcome the rejection. Claim 1 has been

amended to recite “A magnetic resonance imaging apparatus comprising: an RF coil system comprising at least two sets of at least two RF coils which detects RF signals from a region of interest, at least two receiver channels which receive and process the detected RF signals, and a control unit which controls at least one switch that selectively routes at least one detected RF signal towards separate receiver channels via one particular path of at least two possible paths, said at least one detected RF signal is combined with an RF signal of at least two RF coils depending on the imaging parameters, said control unit applies the combined RF signals to separate receiver channels, such that at least two detected RF signals can be combined to form a combined signal and the combined signal is applied to one particular receiver channel.” (Emphasis added) Claim 9 has been amended to recite similar recitations as the recitations added to Claim 1.

Misic does not disclose or suggest at least the newly added limitations to Claims 1 and 9. Misic is directed to a coil interface for coupling a phased array magnetic resonance imaging coil to a magnetic resonance imaging system. The coil interface includes a plurality of signal inputs and a plurality of output ports. Each of the output ports is associated with a receiver in the magnetic resonance imaging system. The coil interface also includes an interface circuit. The interface circuit selectively couples at least two of the signal inputs to at least one of the plurality of input ports. Where the coil is a quadrature phased array coil, in one embodiment, the two quadrature signals can be acquired as a single signal, precombined at the RF level within the coil interface, or as two separate RF signals by two of the receivers of the magnetic resonance imaging system hardware.

Misic does not disclose or suggest structure for selectively routing each signal input via one particular path of at least two possible paths prior to being combined with another signal. To the best of Applicants' understanding of the coil interface described by Misic, each signal is routed along a fixed route. There is no disclosure by Misic that the PIN diode RF switches enable selective routing of each signal input via one particular path of at least two possible paths, as recited by Applicants' Claims 1 and 9. According to column 3, the PIN diode RF switches enable selection of the operational modes of the phased array neurovascular coil 50.

More specifically, Misic does not disclose or suggest at least one switch that selectively routes at least one detected RF signal towards separate receiver channels via one particular path of at least two possible paths, as recited by Applicants' Claim 1. Further, Misic does not disclose or suggest the step of controlling at least one switch that selectively routes at least one detected RF signal towards separate receiver channels via one particular path of at least two possible paths, as recited by Applicants' Claim 9. Accordingly, withdrawal of the rejection under 35 U.S.C. §102(e) and allowance of Claims 1 and 9 are respectfully requested.

Claims 2, 4-6, 9, 10 and 12-14 depend from either Claim 1 or Claim 9, and therefore include the limitations of Claims 1 or 9. Accordingly, for the same reasons given for Claims 1 and 9, Claims 2, 4-6, 9, 10 and 12-14 are believed to contain patentable subject matter. Accordingly, withdrawal of the rejection under 35 U.S.C. §102(e) and allowance of Claims 2, 4-6, 9, 10 and 12-14 are respectfully requested.

Claims 1-6 and 9-14 were rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 5,664,568 issued to Srinivasan et al. on September 9, 1997 (“Srinivasan et al.”).

Independent Claims 1 and 9 have been amended in a manner which is believed to better define Applicants’ invention and to overcome the rejection. Claim 1 has been amended to recite “A magnetic resonance imaging apparatus comprising: an RF coil system comprising at least two sets of at least two RF coils which detects RF signals from a region of interest, at least two receiver channels which receive and process the detected RF signals, and a control unit which controls at least one switch that selectively routes at least one detected RF signal towards separate receiver channels via one particular path of at least two possible paths, said at least one detected RF signal is combined with an RF signal of at least two RF coils depending on the imaging parameters, said control unit applies the combined RF signals to separate receiver channels, such that at least two detected RF signals can be combined to form a combined signal and the combined signal is applied to one particular receiver channel.” (Emphasis added) Claim 9 has been amended to recite similar recitations as the recitations added to Claim 1.

Srinivasan et al. does not disclose or suggest at least the newly added limitations to Claims 1 and 9. Srinivasan et al. is directed to a coil assembly 40 which includes a birdcage type head coil assembly 42 and a neck coil assembly 44. In paragraph 38 of the Office Action, the Examiner notes that Srinivasan et al. lacks directly showing that the interface and/or the sequence controller 60 “controls at least one switch.” However, the Examiner notes that this feature is suggested from Srinivasan et al., because Srinivasan et al. teaches that the coil has an MR interface, with the interface having “individual

channel device drivers” with the images modes depending on whether the individual channels are “on” or “off”.

However, Srinivasan et al. does not disclose or suggest that the interface and/or sequence controller 60 controls at least one switch for selectively routing at least one detected RF signal towards separate receiver channels via one particular path of at least two possible paths, as recited by Applicants’ Claim 1. Further, Srinivasan et al. does not disclose or suggest the step of controlling at least one switch that selectively routes at least one detected RF signal towards separate receiver channels via one particular path of at least two possible paths, as recited by Applicants’ Claim 9. Accordingly, withdrawal of the rejection under 35 U.S.C. §103(a) and allowance of Claims 1 and 9 are respectfully requested.

Claims 2-6 and 10-14 depend from either Claim 1 or Claim 9, and therefore include the limitations of Claims 1 or 9. Accordingly, for the same reasons given for Claims 1 and 9, Claims 2-6 and 10-14 are believed to contain patentable subject matter. Accordingly, withdrawal of the rejection under 35 U.S.C. §103(a) and allowance of Claims 2-6 and 10-14 are respectfully requested.

Claims 8 and 16 were rejected under 35 U.S.C. §103(a) as being unpatentable over Burl et al. as applied to Claims 1-7 and 9 above, and further in view of Pruessmann et al., article titled, “SENSE: Sensitivity encoding for Fast MRI,” Magnetic Resonance in Medicine, vol 42, pages 952-962, 1999 (“Pruessmann et al.”).

Claims 8 and 16 depend from either Claim 1 or Claim 9, and therefore include the limitations of Claim 1 or 16. Accordingly, for the same reasons given for Claims 1 and 9, Claims 8 and 16 are believed to contain patentable subject matter. Accordingly,

withdrawal of the rejection under 35 U.S.C. §103(a) and allowance of Claims 8 and 16 are respectfully requested.

In view of the foregoing amendments and remarks, it is respectfully submitted that all claims presently pending in the application, namely, Claims 1-16, are believed to be in condition for allowance and patentably distinguishable over the art of record.

If the Examiner should have any questions concerning this communication or feels that an interview would be helpful, the Examiner is requested to call John Vodopia, Esq., Intellectual Property Counsel, Philips Electronics North America, at 914-333-9627.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "George Likourezos", written over a horizontal line.

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